EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS

Mark F. Meier
U.S. Geological Survey
1305 Tacoma Avenue South
Tacoma, Washington 98402

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Type I Progress Report
ERTS-A

NOT REPRODUCIBLE

a. Title: Evaluate ERTS Imagery for Mapping and Detection of Changes of Snowcover on Land and on Glaciers.

ERTS-A Proposal No.: SR 342-7

b. GSFC ID No. of P.I.: IN 045

c. Statement and explanation of any problems that are impeding the progress of the investigation:

Our Standing Order Form requests data irrespective of cloud cover from a large area plus six small test sites. As of 24 October, ERTS-1 should have produced more than 853 frames (for each band) over our large area alone. We have, however, received a total of only 53 discrete frames, about half of which have useful data. These have been so widely and randomly distributed in time and space that we still have no data which can be used for regional snowline mapping, and we have no data (except for one small area away from our main test sites where two orbits overlap) which can be used for time-sequence analysis. As these are the main thrusts of the proposal, little has been accomplished.

In particular, we still lack the most important midsummer imagery (28 July and 15 August) of our highest priority test sites #1 and 2 (Washington State) to relate to each other and to the 10 August U-2 flight (from which we have not yet received metric camera data either). We have no more than one image from our other high-priority, small-area test sites #3, 4, 5, and 6 (Alaska) and each of these shows complete cloud cover.

d. Discussion of the accomplishments during the reporting period and those planned for the next reporting period:

Images from 2 June U-2 mission over test sites 1 and 2 have been studied with varying amounts of resolution and in comparison with low-altitude or ground-level data in an attempt to devise a system for identifying the snowline in heavy timber. The problem is receiving further study.

ERTS images began to arrive on 19 September. A system to catalog, identify, and retrieve data from a large collection of material was devised and implemented, but the expected large amount of material has not yet appeared.

Preliminary studies have been made of ERTS images from test sites 1 and 2 (2 September) and excellent quality images from the Western St. Elias-Wrangell Mountains. These studies have been directed to the accuracy of snowline definition at the end of summer (no snow in forest), and some hand planimetry of snow-covered area has been done. Selected images have been set up on the Stanford Research Institute Cloud Console for automatic processing during the week of 24-27 October. Images of Alaskan glaciers have been studied to observe firn lines and the characteristic patterns of glacier surges.

e. Discussion of significant scientific results and their relationship to practical applications or operational problems including estimates of the cost benefits of any significant results:

Preliminary results on the feasibility of mapping snowcover extent have been obtained from a limited number of ERTS-1 images of mountains in Alaska, British Columbia, and Washington. The snowline on land can be readily distinguished, except in heavy forest where such distinction appears to be virtually impossible. The snowline on very large glaciers can also be distinguished remarkably easily, leading to a convenient way to measure glacier accumulation area ratios (AAR) or equilibrium line altitude (ELA). Monitoring of large surging glaciers appears to be possible, but only through observation of a change in area and/or medial moraine extent. Imagery in green or red light (MSS bands 4, 5) shows the snowline more clearly in most areas than imagery in infrared light (MSS band 6). The distinction between snow on large snowfields and stratus-type clouds is very difficult, but the distinction can be made fairly easily where either the snow pattern or the clouds show definite structure. Infrared light (MSS band 6) appears to be advantageous for distinguishing snow from clouds.

Under certain conditions, ERTS imagery appears to have high potential for mapping snowcover in mountainous area. Distinction between snow and clouds appears to require use of the human eye, but in a cloud-free scene the snowcover is sufficiently distinct to allow use of automated techniques. This technique may prove very useful as an aid in the monitoring of the snowpack water resource and the prediction of summer snowmelt runoff volume.

Category designation: 4G, 4H, 2C, 2D

f. A listing of published articles, and/or papers, pre-prints, in-house reports, abstracts of talks, that were released during the reporting period:

N.A.

g. Recommendation concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to a maximum utilization of the ERTS system:

N.A.

h. A listing by date of any changes in Standing Order Forms:

N.A.

i. ERTS Image Descriptor forms:

Under preparation.

j. Listing by date of any changed Data Request forms submitted to Goddard Space Flight Center/NDPF during the reporting period:

N.A.